REMARKS

AS TO DETAILED ACTION

Claims 5, 13, 15 and 17 were amended to show the proper abbreviations of high density polyethylene (HDPE) and chlorinated polyethylene (CPE). The Examiner was correct that these were errors.

AS TO SPECIFICATION

The names Sioplas and Monosil are names used in the art to describe these processes. A trademark search was performed on the PTO Tess for the words Sioplas and Monosil. Sioplas was a registered trademark of Dow Corning Corp., but has been abandoned. The website shows it to be "Dead" (copy attached). A search for Monosil did not show any results, thus it is believed that it is not a registered trademark. We have also seen the words used in various publications without a trademark notation, such as in the "Plastic Pipe and Fittings Association" (PPFA), a copy is attached. We do not believe either of these terms are trademarks, but claims 10 and 24 were amended to use the generic phrase "silane grafting" in place of Sioplas and Monosil.

AS TO THE 35 U.S.C. §112 REJECTION

Claims 12 and 14 were rejected under 35 U.S.C. §112, second paragraph, for insufficient antecedent basis for the PEX layer mentioned in line 4 of the claims. Claims 12 and 14 have been amended and are believed to now comply with 35 U.S.C. §112. The Examiner is respectfully requested to remove this rejection.

AS TO THE 35 U.S.C. §102 REJECTION

Claims 18-20 were rejected under 35 U.S.C. §102(e) as being anticipated by Palmlof (US 6,376,595). The reference Palmlof teaches using a masterbatch as a way of introducing carbon

black into a PEX formulation. Also, Palmlof uses a particular type of base polymer in the masterbatch (a Ziegler-Natta catalyzed HDPE). Palmlof does dislose a level of from 1 to 5 weight % of carbon black in the final PEX product, with a preferred range of 2 to 2.5 wt.%. In Example 1 of Palmlof, 2.5 wt.% carbon black was used (Pipe A) and compared to formulations with no carbon black (Pipe B). Palmlof shows that with a level of 2.5 wt.% carbon black, the PEX pipe has a longer time to failure when pressure tested.

Palmlof uses peroxide to crosslink the PEX. Applicants have amended their claims to exclude peroxide crosslinking. The amended claims now recite that the crosslinking is carried out by either the addition of Azo compounds or the most preferred method of silane grafting.

Claim 18 also recites a level of carbon black of from 0.1 to less than 2 wt.%. Although this level is within the 1-5 wt.% disclosed by Palmlof, Applicants have found this level to be critical to the performance of the pipe when it is in contact with chlorinated water. Applicants' examples show that 2.5 wt.% carbon black is very detrimental to oxidation resistance when tested with chlorinated water. Table 1 shows a 40% test life retention of PEX formulation B when compared to PEX formulation A with no carbon black. Carbon black protects the PEX from UV exposure but is detrimental to oxidation resistance caused by exposure to chlorinated water.

Example 2 of the present application compares PEX pipe with no carbon black, which Example 1 showed to be much better for oxidation resistance to a PEX formulation containing 1 wt.% carbon black. The pipes made from both formulations were tested according to NSF P 171 Chlorine Protocol. The pipes were tested to failure after various exposure time to UV light. The results (Fig. 4) shows the PEX pipe with 1 wt.% carbon black was essentially unchanged even after 1000 hours of accelerated UV exposure, whereas the PEX pipe with no carbon black retained only 34% of its original life when first exposed to 1000 hours of accelerated UV exposure.

These results were very surprising and it appears that PEX formulations need some carbon black to protect against UV exposure, but too much carbon black greatly reduces its life when exposed to chlorinated water. Most household water today is chlorinated, so this is a serious issue.

Applicants have found that a reduced level of carbon black, lower than has been recommended in the past, will give UV protection while also having resistance to oxidation by chlorine. This was unexpected and not a mere optimizing a formulation. PEX pipe has been in the marketplace for many years and the lowest level recommended for carbon black was 2.5 wt.%.

The Examiner is respectfully requested to reconsider the 35 U.S.C. §102 rejection as a result of the amendment and the unexpected results shown in Applicants' Examples.

AS TO THE 35 U.S.C. §103 REJECTIONS

Claims 1-4, 9, 10, and 21-23 were rejected under 35 U.S.C. §103(a) as being unpatentable over Palmlof in view of Behr.

The reference Behr (US 3,292,539) discloses a shot cartridge using a casing made from PEX. Behr uses carbon black as a filler and discloses levels of from 10 to 50 wt.%. Behr also uses peroxide to crosslink the PEX, as did Palmlof discussed above.

The combination of teachings of Palmlof and Behr would not teach one skilled in the art that less than 2 wt.% of carbon black is needed for PEX pipe. Behr would suggest that Palmlof needed to use even higher levels of carbon black than the 2.5 wt.% used in Palmlof's examples.

The claims have been amended to exclude the peroxide crosslinking used by both Palmlof and Behr. The amended claims are not obvious when considering Palmlof in view of Behr. The Examiner is respectfully requested to reconsider and allow the amended claims.

Claims 24 and 25 were rejected under 35 U.S.C. §103(a) as being unpatentable over Palmlof in view of Skarelius. The reference Skarelius (US 4,614,208) discloses a gaseous

resistant multi-layer tubing for use in a heating system. Skarelius uses a PEX layer which is crosslinked by a silane grafting process. Skarelius does not have any teaching on the use of carbon black in the PEX formulation. From the combined teaching of Palmlof in view of Skarelius one skilled in the art would not be led to have a carbon black level less than 2 wt.%. The Examiner is respectfully requested to reconsider and allow claims 24 and 25.

Claims 1-4, 9 and 18-23 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kosewicz in view of Behr and Palmlof. The reference Kosewicz (US 3,033,238) uses a peroxide crosslinking system to crosslink the PEX, as does Behr and Palmlof. The claims have been amended to exclude peroxide as a possible crosslinking system. Kosewicz states at col. 1, lines 33-34, that "substantial amounts" of carbon black is used in his PEX formulation. At col. 1, lines 37-40, Kosewicz suggests using amount as high as 80 wt.% of carbon black in the PEX formulation. Although Palmlof discloses that 1-5 wt.% of carbon black can be used, Behr suggests 10-50 wt.%, and Kosewicz suggests "a substantial amount" and up to 80 wt.%. Both Behr and Kosewicz point one toward using higher amounts of carbon black than the 2.5 wt.% level in Palmlof's example. These teachings point away from the present invention which found that even 2.5 wt.% of carbon black was bad for attack by chlorinated water.

Kosewicz also teaches using an inner layer of uncrosslinked polyethylene to prevent the peroxide from entering the water flowing inside the pipe. Since the present amended claims do not contain peroxide, this is not a concern in the present invention. The present invention is attempting to solve the problem of preventing oxidizing agents like chlorine in the water from attacking the PEX layer of the pipe.

The combined teachings of Kosewicz, Behr and Palmlof do not suggest the level of carbon black used by Applicants, but rather point toward a much higher level. The amended claims are unobvious over the combined teachings of these references. The Examiner is respectfully requested to reconsider and allow the claims.

Claims 5-8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kosewicz in view of Behr and Palmlof and further in view of Stine. Stine (US 4,101,699) discloses making a dimensionally stable tube having a layer of polymer which can be crosslinked by electron beams and a layer of polyethylene which is not able to be crosslinked. Stine discloses the use of fillers, including carbon black, at a level of from 33-71 wt.%. Stine by suggesting high levels of carbon black does not add to the teaching of Palmlof, Behr and Kosewicz, to lead one skilled in the art to arrive at the presently claimed invention. The Examiner is requested to reconsider this rejection and allow the amended claims.

Claims 10 and 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kosewicz in view of Behr and Palmlof and further in view of Skarelius. The references were discussed above. The claims have been amended to exclude peroxide crosslinking. The limitations in claims 10 and 11 when read with the limitations of claim 1 from which they depend are not suggested by the references and do not represent a mere selection by those skilled in the art. The subject of claim 11 is to use an outer layer of PEX that is color coded. The purpose of the color coding is to aid installation, such as red for hot water lines and blue for cold water lines. These features are not suggested by the references. The Examiner is respectfully requested to reconsider and allow these claims.

Claims 12-17 were rejected as unpatentable under 35 U.S.C. §103(a) over Kosewicz in view of Palmlof and Skarelius. The references were discussed above. The references do not teach a three layer pipe having a thin inner layer to protect the intermediate PEX layer from being attacked by chlorine and an outer layer of PEX which is color coded and free of carbon black. Claims 12-17 recite that the main thick layer of PEX has a carbon black level of from 0.1 to 1.75 wt.%. The combination of the features of claims 12-17 is not suggested by the references and would not be obvious to one skilled in the art. The Examiner is respectfully requested to reconsider and allow these claims.

SUMMARY

It is submitted that all of the rejections have been traversed as to the amended claims. Applicants submit that the reduced level of carbon black claimed has unexpected results as shown by the Examples. PEX compositions and PEX pipe have been produced for many years, yet no one has suggested using such a low level of carbon black. Some carbon black is needed to prevent UV degradation but over 2 wt.% makes the PEX subject to attack by chlorine in the potable water. The results shown by Applicants' Examples are very unexpected and are inventive. They represent much more than a mere tweeking of known formulations.

The features recited in the dependent claims are also involved and represent more than good engineering selection. For example, using a thin protective layer inside the pipe to protect the PEX from exposure to chlorine. If a thick layer was used, it would protect the PEX but the pipe would not have enough strength to withstand long service at pressure. The combination of features recited in the amended claims are unobvious from the combination of references cited.

An early allowance of the amended claims is requested and would be greatly appreciated.

Respectfully submitted,

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Attachments

Trademarks > Trademark Electronic Search System(Tess)

TESS was last updated on Tue Nov 8 04:17:51 EST 2005

Record 1 out of 1

Typed Drawing

Word Mark	SIOPLAS
Goods and Services	(EXPIRED) IC 001. US 001. G & S: SILICONES USED TO IMPROVE THE PROCESSING AND/OR PROPERTIES OF ORGANIC PLASTICS AND RUBBERS. FIRST USE: 19711111. FIRST USE IN COMMERCE: 19711111
Mark Drawing Code	(1) TYPED DRAWING
Serial Number	73000988
Filing Date	September 14, 1973
Current Filing Basis	1A
Original Filing Basis	1A
Registration Number	0998373
Registration Date	November 19, 1974
Owner	(REGISTRANT) DOW CORNING CORPORATION CORPORATION MICHIGAN SOUTH SAGINAW ROAD MIDLAND MICHIGAN 48640
Type of Mark	TRADEMARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR).
Live/Dead Indicator	DEAD

PPFA

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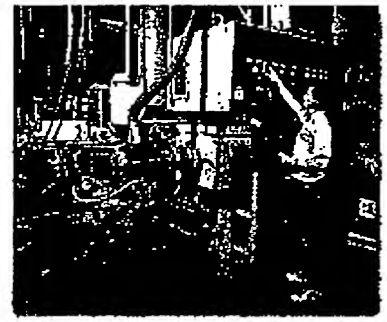
HISTORY



PEX results from chemically joining individual polyethylene molecules in order to improve the performance of the original base resin in higher temperatures. The primary reason for cross-linking polyethylene (PE) is to raise the thermal stability of the material under load. This substantially improves environmental stress crack resistance and resistance to slow crack growth.

In the late 1950s scientists worked on the structure of polyethylene to strengthen the connections between the polymer chains. They developed ways to create additional ties between the PE molecules through covalent or chemical bonding. The result was a PE structure that did not "flow" or move to a softened state as quickly when the temperature is increased.

PEX MANUFACTURING METHODS

There are three primary methods for producing PEX tubing.

1. The "Engel" or peroxide method employs a special extruder with a plunger action where peroxide is added to the base resin and through a combination of pressure and high temperature the cross-linking takes place as the tubing is produced.

2. The "Silane" method of PEX production involves grafting a reactive silane molecule to the backbone of the polyethylene. The tubing is produced by blending this grafted compound with a catalyst which can be done using either the Sioplas method or by using a special extruder it can be done using the Monosil method. After extrusion the tubing is exposed to either steam or hot water to induce the final cross-linking reaction in the tubing.

3. Electron Beam crosslinking takes place when very high energy radiation is used to initiate molecular cross-linking in high density polyethylene. This product is extruded like normal HDPE then taken to an E-beam facility and routed under a beam or ray in the accelerator where it is dosed with a specific amount of radiation to release the hydrogen atoms and cause polymer cahins to bond or link to the open carbon sites.

In European standards these three methods are referred to as PEX-A, PEX-B and PEX-C, respectively and are not related to

any type of rating system. All the resulting PEX tubing products perform similarly and are rated for performance by the ASTM, NSF and CSA standards for which they are tested and certified. The listings and certifications met by each product are printed on the printline of the tubing itself to ensure the product is used in the proper applications it was designed for.

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